PROBLEM:

Pick the correct frequency response and enter the number in the answer box:

Difference Equation or Impulse Response

(a) $h[n] = (-\frac{1}{4})^n u[n]$

ANS =

(b) $h[n] = \delta[n] + \delta[n-1] + \delta[n-2]$

ANS =

(c) $h[n] = -4\delta[n] + 5(\frac{1}{4})^n u[n]$

ANS =

(d) $y[n] = -\frac{1}{4}y[n-1] + x[n] + x[n-1]$

ANS =

Frequency Response

1. $H(e^{j\hat{\omega}}) = \dfrac{1 + e^{-j\hat{\omega}}}{1 - \frac{1}{4}e^{-j\hat{\omega}}}$

2. $H(e^{j\hat{\omega}}) = \dfrac{1 + e^{-j\hat{\omega}}}{1 + \frac{1}{4}e^{-j\hat{\omega}}}$

3. $H(e^{j\hat{\omega}}) = 1 + e^{-j\hat{\omega}}$

4. $H(e^{j\hat{\omega}}) = \dfrac{1}{1 - \frac{1}{4}e^{-j\hat{\omega}}}$

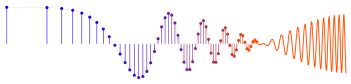
5. $H(e^{j\hat{\omega}}) = e^{-j1.5\hat{\omega}} \dfrac{\sin 2\hat{\omega}}{\sin(\frac{1}{2}\hat{\omega})}$

6. $H(e^{j\hat{\omega}}) = e^{-j\hat{\omega}}(1 + 2\cos(\hat{\omega}))$

7. $H(e^{j\hat{\omega}}) = \dfrac{1}{1 + \frac{1}{4}e^{-j\hat{\omega}}}$

McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION



Pick the correct frequency response and enter the number in the answer box:

Difference Equation or Impulse Response

(a) $h[n] = (-\frac{1}{4})^n u[n]$

ANS = 7

$$H(z) = \frac{1}{1+\frac{1}{4}z^{-1}}$$

$$H(e^{j\hat{\omega}}) = \frac{1}{1+\frac{1}{4}e^{-j\hat{\omega}}}$$

(b) $h[n] = \delta[n] + \delta[n-1] + \delta[n-2]$

ANS = 6

$$H(e^{j\hat{\omega}}) = 1 + e^{-j\hat{\omega}} + e^{-j2\hat{\omega}}$$
$$= e^{-j\hat{\omega}}(e^{j\hat{\omega}} + 1 + e^{-j\hat{\omega}})$$
$$= e^{-j\hat{\omega}}(1 + 2\cos\hat{\omega})$$

(c) $h[n] = -4\delta[n] + 5(\frac{1}{4})^n u[n]$

ANS = 1

$$H(z) = -4 + \frac{5}{1-\frac{1}{4}z^{-1}}$$
$$= \frac{1+z^{-1}}{1-\frac{1}{4}z^{-1}} \Rightarrow H(e^{j\hat{\omega}}) = \frac{1+e^{-j\hat{\omega}}}{1-\frac{1}{4}e^{-j\hat{\omega}}}$$

(d) $y[n] = -\frac{1}{4}y[n-1] + x[n] + x[n-1]$

ANS = 2

$$H(z) = \frac{1+z^{-1}}{1+\frac{1}{4}z^{-1}} \Rightarrow H(e^{j\hat{\omega}}) = \frac{1+e^{-j\hat{\omega}}}{1+\frac{1}{4}e^{-j\hat{\omega}}}$$

Frequency Response

1. $H(e^{j\hat{\omega}}) = \dfrac{1+e^{-j\hat{\omega}}}{1-\frac{1}{4}e^{-j\hat{\omega}}}$
2. $H(e^{j\hat{\omega}}) = \dfrac{1+e^{-j\hat{\omega}}}{1+\frac{1}{4}e^{-j\hat{\omega}}}$
3. $H(e^{j\hat{\omega}}) = 1 + e^{-j\hat{\omega}}$
4. $H(e^{j\hat{\omega}}) = \dfrac{1}{1-\frac{1}{4}e^{-j\hat{\omega}}}$
5. $H(e^{j\hat{\omega}}) = e^{-j1.5\hat{\omega}} \dfrac{\sin 2\hat{\omega}}{\sin(\frac{1}{2}\hat{\omega})}$
6. $H(e^{j\hat{\omega}}) = e^{-j\hat{\omega}}(1 + 2\cos(\hat{\omega}))$
7. $H(e^{j\hat{\omega}}) = \dfrac{1}{1+\frac{1}{4}e^{-j\hat{\omega}}}$

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